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Crossover from 2D-XY to 3D-XY superconducting fluctuations with hole-doping in dynamical conductivity of $La_{2-x}Sr_xCuO_4$ thin films by broadnband technique A. MAEDA, H. KITANO, T. OHASHI, Dept. Basic Sciences, University of Tokyo, I. TSUKADA, Central Research Institute of Electrical Power Industry — We report the systematic study of dynamical complex ac conductivity, $\sigma(\omega) = \sigma_1(\omega) + i\sigma_2(\omega)$, of high-quality $La_{2-x}Sr_xCuO_4$ (LSCO) (x=0.07 to 0.24) thin films ate temperatures (Ts) just above the superconducting transition temperature, T_c, by using a broadband microwave technique, where both components of the complex conductivity can be obtained as a detailed function of frequency by sweeping the microwave frequency continuously (0.1 to 12 GHz). For all superconducting films, we observed a definite contribution of the superconducting fluctuation to $\sigma(\omega, T)$, which could not be described by the conventional Aslamazov-Larkin term. Detailed analyses using a dynamic scaling theory clearly indicated that the fluctuation can be well described by the 2D-XY critical behavior for the underdoped LSCO samples, whereas it changes into the 3D-XY critical behavior in the optimally doped samples. We are now fixing the fluctuation behavior in the overdoped samples, which is very important to judge whether or not the quantum-criticality picture proposed in some theories is appropriate for the description of the electronic state of the high-T_c cuprate superconductors.

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